

Amendments to the Drawings

The attached sheet of drawings includes changes to item 48.

Attachment: Replacement Sheet

Remarks/Arguments

Claims 1-18 are pending in the present application. claims 2, 8 and 14 are amended herein. No claims have been added or canceled.

The Examiner rejected all the claims under 35 USC 103 under various combinations of Hurlburt ( USPN 6,267,198), Stracke (DE 8902158) and Abbott (Abbott and Hinerman, "Suspension and Steering").

The Examiner relied upon Abbott for the teaching of a steering angle inclined inwardly and a pivot axis inclined rearward relative to the forward driving direction. Abbott cannot be relied upon for the reasons provided below.

The references are combined to solve problems that do not exist in the field of agricultural harvesters. The Examiner combines the references to provide a solution to non-existent problems in the agricultural vehicle (more particularly, the agricultural harvester) art.

The Examiner borrows problems from the automotive art (i.e. Abbott) that do not exist for agricultural harvesters or conversely are a benefit in the agricultural vehicle arts. The references cannot properly be combined, therefore, because (1) the problems Abbott notes do not exist with agricultural harvesters to which the claims are limited and therefore cannot be used to teach the combination the Examiner suggests, and (2) agricultural harvester art is different than automotive art.

Abbott allegedly teaches that an inclined steering angle "is useful because it reduces the need for excessive caster and camber angles, distributes the weight of the vehicle more nearly under the road contact of the tire and provides for ease of steering." while we do not doubt that these are true of the front suspensions of over-the-road automobiles of the conventional type in 1982 (the date of publication of Abbott) we do not believe they are applicable to the design and construction of agricultural harvesters. In short, Abbott would teach an automobile manufacturer to construct a front suspension as Abbott describes, but our claims are limited to

agricultural harvesters, a completely different art, with a different set of problems that do not include the problems that Abbott states.

First, "excessive caster and camber angles" cited by the Examiner are not a problem for agricultural harvesters, since, as Hurlburt shows, agricultural harvesters generally do not have caster or camber angles to begin with. No reference says that excessive harvester caster and camber angles are a problem that needs to be solved. Nor do harvester have them.

Agricultural harvesters are slow-moving, field-working machines that travel over extremely rough terrain at last as compared to Abbott's automobiles). Harvesters are massive vehicles that require 100% power steering to steer. Automobiles, in contrast, are designed to provide easy steering with no pull to the right or left on the steering wheel when traveling at high speeds for long distances in a straight line on very flat paved roads.

Second, agricultural harvesters do not use the traditional automotive suspensions that Abbott describes, and thus do not recommend themselves to one skilled in the art. "Distributing the weight more nearly under the road" is not a problem because agricultural harvesters are not engineered to spend their productive lives traveling on the road at high speeds (as cars do), but to wallow through agricultural fields at very low speeds, typically 8-20 miles per hour. Further, weight distribution is not a problem since it is solved by the central pivot axle construction such as that shown in Hurlburt. This design is not used in automobiles, but is commonly used in agricultural harvesters which operate over ploughed and irregular ground (not Abbott's roads) that may vary in height by several inches, far beyond that of Abbott's automobiles. Again, because of their large mass, irregular train and slow speeds, such automotive designs for equalizing weight are not used. Abbott, again, is directed to automobiles which drive on very flat roads at high speeds using independent front suspensions, which is a different art and has a different set of problems.

Third, "ease of steering" is not a problem with agricultural harvesters and thus is not something to be overcome. Harvesters have long used power steering systems that virtually eliminate all effort by the operator. Indeed, and unlike Abbott's cars, manually steered harvesters in which the operator supplies the motive force for turning the vehicle are non-existent. For this reason the "ease" with which an operator can steer the combine is immaterial. Ease is only a problem if the operator actually has to directly exert a physical force on the steering linkages as an operator of a car has to do and the linkages and steering components can exert a significant force back through the system to the operator's hands. This is not how steering systems for harvesters are arranged.

Fourth, the Examiner asserts that the pivot axis is "inclined rearward relative to the forward driving direction in order to provide positive caster and help ease steering" by "providing a geometry that helps return the steered wheel to its straight-ahead position." We have all experienced this assistance when driving passenger cars. When we release the steering wheel it spins back to its neutral, central position.

The flip side of this automatic return-to-center provided by positive caster is that turning the vehicle hard to one side or another takes significant force, and the vehicle can only be maintained in this hard turn position by pulling hard on the steering wheel.

This effort needed to sharp turn a vehicle due to positive caster is not a problem with automobiles, since drivers very, very seldom make these extremely sharp turns. U-turns in the middle of a road being a prime (but rare) exception, drivers operate automobiles in a straight-ahead fashion 99.9% of the time, turning the steering wheel to the left and right only a few degrees at best.

Unfortunately, this sharp turning is precisely what harvester drivers do at the end of each pass through an agricultural field. Every time a harvester reaches the end of a field, the operator makes a sharp 180-degree U-turn in much the same manner and with the same effort that the driver of a car makes a sharp U-turn in the road in order to head back in the opposite direction in the immediately adjacent lane of traffic. The

only difference between the two is that the harvester operator performs a sharp U-turn every few hundred feet. A sharp U-turn in an automobile may happen once every few weeks or months. A sharp U-turn in an agricultural harvester happens every few seconds. A positive caster that "eases steering" for Abbott's car driver will be well nigh unbearable for a farmer driving a harvester.

Furthermore, a positive caster means the operator cannot release the steering wheel in the middle of a sharp U-turn but must hold on (typically with both hands) until he can release the wheel and permit it under its own power to spin back to its neutral center position. Again, we are all familiar with this phenomenon in our own automobiles.

This is fine in Abbott's automotive arts where the operator is instructed to keep both hands on the steering wheel at all times and spends 99.9% of his time traveling straight down the road, at worst turning the steering wheel a few degrees to one side or the other.

In the agricultural vehicle arts, however, the farmer must manipulate a variety of controls at the end of each pass through the agricultural field, to raise and lower implements, to engage and disengage actuators, and to perform variety of other manipulations.

All of these tasks would be quite difficult to do if the steering wheel, due to positive caster, fought to return to its center neutral position. For this reason, harvesters are engineered *not* to return automatically to neutral when the steering wheel is released, but to continue following the turning path selected by the farmer until the farmer actually turns the vehicle back onto its straight path. The automatic return to neutral that eases a car driver's effort would effectively prevent a farmer from operating combine controls in his every-few-seconds end-of-field U-turns by requiring him to keep both hands pulling on the steering wheel during the turns. What increases "ease" in the automotive arts increases difficulty in the agricultural harvester arts.

For at least these reasons, we submit that the automotive arts and the agricultural vehicle arts are different, that an improvement in one art may be a disadvantage in another and vice versa, that what is a problem in one art may be a benefit in the other, that Abbott is a case in point and therefore that the teachings of Abbott are not applicable to the agricultural harvester art nor can they be used as a teaching to combine other references in the agricultural arts.

In conclusion, it is believed that this application is in condition for allowance, and such allowance is respectfully requested.

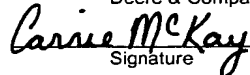
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Respectfully,

  
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